

BROOKHAVEN NATIONAL LABORATORY Safety & Health Services Division INDUSTRIAL HYGIENE GROUP Standard Operating Procedure	NUMBER IH51660
	REVISION FINAL rev6
SUBJECT: Program Procedure Instrument Calibration and Maintenance Program	DATE 07/07/06
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CALIBRATED	
By: _____	Date: _____
Due: _____	

1.0 Purpose & Scope

This document describes the SHSD Industrial Hygiene Group (IHG) *Calibration and Maintenance Schedule* policy for direct reading instrument and air sampling pumps. Its purpose is to establish IHG policy on the frequency and mechanism for calibration and repair of IHG instrumentation.

The goal of the procedure is to provide a uniform protocol for preserving IHG instrumentation in a manner that will result in accurate, precise, and reliable readings from the instruments.

Procedures for maintenance and/or calibration of individual pieces of equipment are documented in separate SOPs within the IHG's written documentation.

2.0 Responsibilities

- 2.1 **Program Administration:** This procedure is administered through the SHSD Industrial Hygiene Group. Members of the SHSD Industrial Hygiene Group are required to follow this procedure.

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3.0 Definitions

- 3.1 **Program Administrator:** A person designated by the IH Group Leader to administer this procedure and associated sampling equipment management.
- 3.2 **Equipment Custodian:** A person designated by the IH Group Leader or Program Administrator to process equipment for maintenance and calibration in accordance with this procedure.

4.0 Prerequisites

None

5.0 Precautions

- 5.1 **Personal Protective Equipment:** The use of personal protective equipment to protect personnel handling IHG instrumentation during preparation for calibration and maintenance is not typically required.

If it is necessary to handle equipment with potential surface contamination, at a minimum, disposable gloves must be used when contacting the exposed surfaces. Do all handling of contaminated equipment within a laboratory hood.

- 5.2 **Radiological Contamination:** It is possible that some equipment may have been taken into areas with radiological contamination. The IHG person handling equipment must verify from RCD that the equipment has been analyzed for the radiological hazard and are at radiological contamination levels below the permissible release limits to the general public.

6.0 Procedure

- 6.1 **Equipment:** Calibration Labels, from BNL PPM Stock or equivalent. See Section 6.5 for wording.

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6.2 **Determining the frequency of calibration.** Refer to Attachment 9.1 to this procedure for a list of IHG instrumentation and the IHG determined calibration frequency. Calibrations are to be completed within the frequency listed in Attachment 9.1 or the equipment must be removed from service.

6.3 **Establishing the Frequency of calibration.** The calibration frequency listed in Attachment 9.1 is determined by the Program Administrator based on the following hierarchy of references (based on DOE O 414.1A):

- 6.3.1 Manufacturer's recommendation as stated in the instruments *Operation Manual* or *Owner's Instruction Manual*.
- 6.3.2 Manufacturer's recommendation as stated in other means of communication with BNL, such as memorandum, e-mails, or documented phone conversations.
- 6.3.3 Other engineering/scientific standards specifically referring to a particular type of instrumentation.
- 6.3.4 IHG determination of calibration needs based on experience with the equipment or recommendations by other sources.

6.4 **Calibration Procedures:** This SOP does not provide specific calibration procedure methodology. Follow IH Group written procedures specific to instruments that IHG performs calibrations "in-house" for the methodology for calibration.

6.5 **Documenting Calibration Status:** The on-going calibration status of each IHG electronic instrument (other than sampling pumps) must be marked on the meter by means of a label on the meter. The label must, at a minimum, indicate that the meter is "calibrated" and show the date of expiration.

- 6.5.1 For meters calibrated by vendors, a label may have been placed on the meter. IHG will add any of the following missing information on an auxiliary label: company name performing calibration, date of calibration, and expiration or due date.
- 6.5.2 The sticker used by IHG for "in-house" calibration must contain at least the following wording:

CALIBRATED	
BY_____	DATE_____
DUE_____	

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- 6.5.3 For equipment that is out of service and has expired on the acceptable calibration interval , but is being held in reserve as a potential replacement, a label with the following wording shall be prominently placed on the equipment:



- 6.5.4 Log the date of calibration in the IHG Intellitrack® database.

6.6 Maintenance of Instruments: The IHG policy on routine maintenance for equipment:

- 6.6.1 Sampling Pumps: Repair and routine replacement of expendable parts such as diaphragms and batteries shall be done as needed when instruments fail to calibrate or fails operate within required parameters.
- 6.6.2 Meters and Instruments:
- 6.6.2.1 Off-site Calibration- Meters receive routine maintenance during their periodic calibration by off-site vendors.
- 6.6.2.2 On-site Calibration- Meters calibrated by IHG will receive maintenance or repair if they fail to calibrate within specifications or fail to operate within typical parameters.
- 6.6.3 Damage or abuse: When IHG meters show signs of damage or abuse they will be repaired by IHG or the manufacturer as needed.

7.0 Implementation and Training

- 7.1 **Qualification Criteria:** Only individuals who have demonstrated knowledge of this procedure to the satisfaction of the IH Group Leader, the Program Administrator, or their designee will be qualified to perform any activities described in this procedure. The qualification criteria to conduct work following this procedure are:

- 7.1.1 Specific knowledge of this procedure shown by an ability to answer questions on procedure.
- 7.1.2 Personnel shall be re-qualified at a frequency not to exceed three years.

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- 7.1.3 If significant and substantive changes to the procedure are made, all qualified *Equipment Custodians* will be notified of the changes.
- 7.1.4 Personnel performing maintenance on energized electrical meters or pumps in a condition that potentially exposes them to the energy source (meets definitions of “hot work”) must meet all BNL training and medical approval requirements.

8.0 References

- 8.1 DOE Order 414.1A.
- 8.2 Numerous manufacturers’ operation manuals were reviewed in the creation of Attachment 9.1. References to manufacturers are included in Attachment 9.1.

9.0 Attachments

- 9.1 **Equipment Custodian Qualification form**
- 9.2 **BNL Instrument Calibration Frequency Policy**

The only official copy is on-line at the SHSD IH Group website.
Before using a printed copy, verify that it is current by checking the document issue date on the website.

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10.0 Documentation

Document Development and Revision Control Tracking		
PREPARED BY: <i>(signature and date on file)</i> R. Selvey <i>(signature and date on file)</i> D. Wadman Date: 02/14/01	REVIEWED BY: <i>(signature and date on file)</i> R. Wilson <i>(signature and date on file)</i> J. Peters Date: 02/15/01	APPROVED BY: <i>(signature and date on file)</i> R. Selvey IH Group Leader Date: 03/07/01
ESH Coordinator/ Date: <i>none</i>	Work Coordinator/ Date: <i>none</i>	SHSD Manager / Date <i>none</i>
QA Representative / Date: <i>none</i>	Training Coordinator / Date: <i>none</i>	Filing Code: IH52
Facility Support Rep. / Date: <i>none</i>	Environ. Compliance Rep. / Date: <i>none</i>	Effective Date: 03/18/03
ISM Review - Hazard Categorization <input type="checkbox"/> High <input checked="" type="checkbox"/> Moderate <input type="checkbox"/> Low/Skill of the craft	Validation: <input type="checkbox"/> Formal Walkthrough <input type="checkbox"/> Desk Top Review <input type="checkbox"/> SME Review Name / Date:	Implementation: Training Completed: Tracked in BTMS Procedure posted on Web: 06/28/06 Hard Copy files updated: 06/28/06

Revision Log		
Purpose: <input type="checkbox"/> Temporary Change <input type="checkbox"/> Change in Scope <input type="checkbox"/> Periodic review <input checked="" type="checkbox"/> Clarify/enhance procedural controls		
Changed resulting from: <input type="checkbox"/> Environmental impacts <input type="checkbox"/> Federal, State and/or Local requirements <input type="checkbox"/> Corrective/preventive actions to non-conformances <input checked="" type="checkbox"/> none of the above		
Section/page and Description of change: Renumbered from IH60660 to 51660 to correct clerical mistake.		
R. Selvey 04/24/01 (Signature and date on file) SME Reviewer/Date:	Reviewer/Date:	Reviewer/Date:
Purpose: <input type="checkbox"/> Temporary Change <input type="checkbox"/> Change in Scope <input checked="" type="checkbox"/> Periodic review <input checked="" type="checkbox"/> Clarify/enhance procedural controls		
Changed resulting from: <input type="checkbox"/> Environmental impacts <input type="checkbox"/> Federal, State and/or Local requirements <input type="checkbox"/> Corrective/preventive actions to non-conformances <input checked="" type="checkbox"/> none of the above		
Section/page and Description of change: Revised Table to add new instruments and revise policy on some meters		
R. Selvey 01/29/02 (Signature and date on file) SME Reviewer/Date:	SME Reviewer/Date:	SME Reviewer/Date:

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Purpose: <input type="checkbox"/> Temporary Change <input type="checkbox"/> Change in Scope <input type="checkbox"/> Periodic review <input checked="" type="checkbox"/> Clarify/enhance procedural controls Changed resulting from: <input type="checkbox"/> Environmental impacts <input type="checkbox"/> Federal, State and/or Local requirements <input type="checkbox"/> Corrective/preventive actions to non-conformances <input checked="" type="checkbox"/> none of the above Section/page and Description of change: Revised Section 7 and Attachment 9.1 to add new instruments and revise policy on some meters. Added "IHG" changes to policy.		
R. Selvey 03/17/03 (Signature and date on file) SME Reviewer/Date:	SME Reviewer/Date:	SME Reviewer/Date:
Purpose: <input type="checkbox"/> Temporary Change <input type="checkbox"/> Change in Scope <input checked="" type="checkbox"/> Periodic review <input type="checkbox"/> Clarify/enhance procedural controls Changed resulting from: <input type="checkbox"/> Environmental impacts <input type="checkbox"/> Federal, State and/or Local requirements <input type="checkbox"/> Corrective/preventive actions to non-conformances <input checked="" type="checkbox"/> none of the above Section/page and Description of change: Revised Attachment 9.1 to add new instruments and revise policy on some meters.		
R. Selvey 12/13/04 (Signature and date on file) SME Reviewer/Date:	SME Reviewer/Date:	SME Reviewer/Date:
Purpose: <input type="checkbox"/> Temporary Change <input type="checkbox"/> Change in Scope <input checked="" type="checkbox"/> Periodic review <input checked="" type="checkbox"/> Clarify/enhance procedural controls Changed resulting from: <input type="checkbox"/> Environmental impacts <input type="checkbox"/> Federal, State and/or Local requirements <input type="checkbox"/> Corrective/preventive actions to non-conformances <input checked="" type="checkbox"/> none of the above Section/page and Description of change: Change to format of Section 10. Added Attachment 9.1 JPM Qualification Form. Update Attachment 9.2 with Quest 2100 and Quest DLX dosimeter.		
R. Selvey 6/28/06 (signature/date on file) SME Reviewer/Date:	SME Reviewer/Date:	SME Reviewer/Date:
Purpose: <input type="checkbox"/> Temporary Change <input type="checkbox"/> Change in Scope <input type="checkbox"/> Periodic review <input type="checkbox"/> Clarify/enhance procedural controls Changed resulting from: <input type="checkbox"/> Environmental impacts <input type="checkbox"/> Federal, State and/or Local requirements <input type="checkbox"/> Corrective/preventive actions to non-conformances <input checked="" type="checkbox"/> none of the above Section/page and Description of change: Update Attachment 9.2 with TSI Particle Counter and Chatillon Force Gauge		
R. Selvey 07/07/06 (signature/date on file) SME Reviewer/Date:	SME Reviewer/Date:	SME Reviewer/Date:

Equipment Custodian Job Performance Measure (JPM) Completion Certificate

Candidate's Name	Life Number:
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Practical Skill Evaluation: Demonstration of Evaluation Methodology by Oral Exam

Criteria	Qualifying Performance Standard	Unsat.	Recov.	Satisf.
1. Sampling Equipment	Knows where equipment needed for the procedure is located and how to instruct others to properly sign it out.			
2. Pre-Testing Inspection	Verifies the equipment to be used is operational and calibrated. .			
3. Calibration	Knows how to properly determine the calibration frequency and how to process equipment for calibration from the proper source.			
4. Documentation	Demonstrates correctly filling out IH equipment calibration and maintenance forms. And how and where to properly store records.			

I accept the responsibility for performing this task as demonstrated within this JPM and the corresponding SOP.

Candidate Signature:	Date:
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I certify the candidate has satisfactorily performed each of the above listed steps and is capable of performing the task unsupervised.

Evaluator Signature:	Date:
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IH51660 Attachment 9.2 BNL Instrument Calibration Frequency Policy

Date: 07/08/06 (1)

Meter	Manufacturer & Address/Phone	Manufacturer Calibration Frequency Recommendation	BNL Calibration Frequency Policy	BNL Calibration Mechanism
Alnor Swinging Vane Anemometer Models: 6000P	Alnor 7555 N. Linden Ave. Skokie, IL 60097 312-677-3500	Recommendation Reference: Not required Operation Manual Manual Date: 11/77 6270 Page: 13	None Calibration only after damage.	If needed due to damage: RCD IC wind tunnel or Offsite vendor
Alnor Compuflo Air Velocity Meter Models: 8500D-11	Alnor 7555 N. Linden Ave. Skokie, IL 60097 312-677-3500	Recommendation Reference: No recommendation stated Operation Manual Manual Date: 1984 Page: 13	Out of service , held as back-up for TSI anemometers, if used Annual	RCD IC wind tunnel or Offsite vendor
Arizona-Jerome Mercury Vapor Analyzer Model: Jerome 431-X	Arizona Instrument 4114 East Wood Street Phoenix, AZ 85040-1941 (602) 470-1414 (800) 235-3360 FAX: (602) 470-1888	Recommendation Reference: Annually Operation Manual Manual Date: July, 1996 Page: 12	Annual	Offsite Vendor
Bacharach Sentinel Personal Gas Monitor Model: Sentinel 44T & 44	Bacharach 625 Alpha Drive Pittsburgh, PA 15238-2878 Phone: (412) 963-2000	Recommendation Reference: As per user set intervals Operation Manual Manual Date: 5/95, Rev. 2 Pages: 5-9 & 8-2	Out of Service [Annual (minimum), target goal is Quarterly]	IHG single point calibration with standard gas for each sensor
			Out of Service [Before each use]	IHG bump check with gas for each sensor to be measured in field.
Bios Dry Cal Calibrator Model: BIOS DC-1	Bios International Corp. 230 W. Parkway Unit 1 Pompton Plains, NJ 07444 800-663-4977	Recommendation Reference: No recalibration required Operation Manual Manual Date: 2/5/97 Page: section 2.0	None	IHG with Soap Film Flow Meter multipoint calibration or Off-site Vendor
Bios Dry Cal Calibrator Model: BIOS DC-2	Bios International Corp. 230 W. Parkway Unit 1 Pompton Plains, NJ 07444 800-663-4977	Recommendation Reference: No recalibration required Operation Manual Manual Date: Page: section	Annual	IHG with Soap Film Flow Meter multipoint calibration or Off-site Vendor
B&K	Bruel & Kjaer Instruments, Inc.	Recommendation Reference:	Annual	IHG field calibrator

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Date: 07/08/06 (2)

Meter	Manufacturer & Address/Phone	Manufacturer Calibration Frequency Recommendation	BNL Calibration Frequency Policy	BNL Calibration Mechanism
Sound Level Meter Model: Type 2236	185 Forest Street Marlborough, MA 01752-3093 Phone: (508) 481-7737 FAX (508) 624-0503	No Recommendation stated Operation Manual Manual Date: Oct., 1993 Page: 7-1		multiple frequency calibration Flat weighted, off-site vendor if fails
			Prior to and after each use	IHG field calibrator, single point at 1000 Hz A-weighted for SPL
			Prior to and after each use	IHG field calibrator, single point at 62- 4000 Hz for OBA
B&K Calibrator Model: 4231	Bruel & Kjaer Instruments, Inc. 185 Forest Street Marlborough, MA 01752-3093 Phone: (508) 481-7737 FAX (508) 624-0503	Recommendation Reference: Annual as per ANSI S1.40 Operation Manual Manual Date: 1/94 Page: 3-4		
CAHN Micro Balance	Cahn 16207 S. Carmenita Rd. Cerritos, CA 90701 213-926-3378	Recommendation Reference: Each time power is lost Operation Manual Manual Date: no date Page:6	Out of service, Calibrate prior to use and Each time power is lost & Annual	IHG test with two Cahn calibration sources, if out of calibration so that it cannot be electronically set, vendor service call will be made.
Casella Digital Impulse Sound Level Meter Model: CEL-254	Casella CEL Tech Park, 17 Old Nashua Road, Box 15 Amherst NH 03031 (800) 366-2966	Recommendation Reference: Use CEL-282 before and after use. Recommended that the calibration be verified at least annually. Operation Manual Manual Date: 060064, issue 8, Jan 02 Page: 2 & 3	Annual	Off-site Vendor
			Prior to and after each use	IHG field calibrator, single point
Casella Acoustical Calibrator Model: CEL-282	Casella CEL Tech Park, 17 Old Nashua Road, Box 15 Amherst NH 03031 (800) 366-2966	Recommendation Reference: Recommend including calibrator in factory maintenance agreement to extend warranty. Operation Manual Manual Date: 060050, Issue 4; Aug 1999 Page: last page of tri-fold	Annual	Off-site Vendor

IH51660 Attachment 9.2 BNL Instrument Calibration Frequency Policy

Date: 07/08/06 (3)

Meter	Manufacturer & Address/Phone	Manufacturer Calibration Frequency Recommendation	BNL Calibration Frequency Policy	BNL Calibration Mechanism
		instructions		
Ametek Chatillon® DFE Series Digital Force Gauge	Ametek TCI Division Chatillon Systems 8600 Somerset Drive Largo, FL 33773 (800) 527-9999	Recommendation Reference: No recommendation stated Operation Manual Manual Date: NC002775 Issue 1 Dec 2004 Page: Section Calibrating, Pages 1-8	Every two years at the factory (Factory calibration may be skipped if the meter is tested and found within a tolerance of +/- 1% on a two point verification in both compression and tension directions with NIST Traceable Class 5 or better weights)	Ametek authorized distributor or Ametek only.
Dasibi Ozone- UV Photometric Ozone Analyzer Model: 1008-PC	Dasibi Environmental Corp. 506 Paula Ave. Glendale, Calif. 91201	Recommendation Reference: No recommendation stated Operation Manual Manual Date: 1990 Page: 6-1, 6-11	3 years	Factory or off-site vendor calibration, maintenance, and check of internal generation source lamp
			Annual	IHG multiple point calibration with internal ozone generation source
Extech Light Meter	Extech Instruments (781) 890-7440 www.extech.com	Recommendation Reference: None Operation Manual Manual Date: 8808-59-102 Page:	Out of service No OEL compliance use allowed without calibration	Off-site vendor
Extech Real Time Octave Band Analyzer Model 407766	Extech Instruments (781) 890-7440 www.extech.com	Recommendation Reference: Recommended recalibration on an annual basis Operation Manual Manual Date: Ver 2.0 October 2001 Page: 4 of 4	Annual	Off-site Vendor
			Prior to and after each use	IHG field calibrator, single point at 1000 Hz A-weighted for SPL
			Prior to and after each use	IHG field calibrator, single point at 62- 4000 Hz for OBA
Extech Acoustic Calibrator Model 407766	Extech Instruments (781) 890-7440 www.extech.com	Recommendation Reference: Recommended recalibration on an annual basis Operation Manual Manual Date: Ver 2.0 October 2001 Page: 4 of 4	Annual	Off-site Vendor
FW Bell Hand-held Gauss/Tesla	F.W. Bell 6120 Hanging Moss Road	Recommendation Reference: No Recommendation stated	Out of service, If used: Annual	Off-site vendor or

IH51660 Attachment 9.2 BNL Instrument Calibration Frequency Policy

Date: 07/08/06 (4)

Meter	Manufacturer & Address/Phone	Manufacturer Calibration Frequency Recommendation	BNL Calibration Frequency Policy	BNL Calibration Mechanism
Meter Model: Model 4048	Orlando, FL 32807 Phone: (407) 678-6900	Operation Manual Manual Date: 881001 TD 360686 Page: entire manual reviewed		IHG check to NIST standard source
GAST High Flow Pump Model: GAST	GAST	Recommendation Reference: Operation Manual Manual Date: Page:	Prior to and after each use	BY IHG via - DryCal - Dry Test meter
GenRad Octave Band Analyzer Model: GenRad 1982	No longer manufacturer.	Recommendation Reference: none Operation Manual Manual Date: Page:	Annual	IHG field calibrator multiple frequency calibration Flat weighted, off-site vendor if fails
			Prior to and after each use	IHG field calibrator, single point at 62- 4000 Hz for OBA
Holaday Clamp On Induced Current Meter Model: HI-3702	Holaday Industries, Inc. 14825 Martin Drive Eden Prairie, Minnesota 55344 Phone: (612) 934-4920 FAX: (612) 934-3604 Email: Sales@holadyinc.com	Recommendation Reference: Yearly Operation Manual Manual Date: 1/98 Page: 14	Annual	Off-site vendor
Holaday VDT Radiation Survey Meter Model: HI-3600 VLF HI-3600-02 ELF	Holaday Industries, Inc. 14825 Martin Drive Eden Prairie, Minnesota 55344 Phone: (612) 934-4920 FAX: (612) 934-3604 Email: Sales@holadyinc.com	Recommendation Reference: No Recommendation stated Operation Manual Manual Date: 08/89 Page:	Out of Service for OEL compliance monitoring Can be used for qualitative detection of fields, but not quantifying field strength without Annual calibration Annual Factory calibration is required for OEL compliance monitoring	Off-site vendor
Holaday Magnetic Field Monitor/Dosimeter Model: HI-3550	Holaday Industries, Inc. 14825 Martin Drive Eden Prairie, Minnesota 55344 Phone: (612) 934-4920 FAX: (612) 934-3604 Email: Sales@holadyinc.com	Recommendation Reference: Annual Operation Manual Manual Date: 11/93 Pages: 10 & 11	Annual	Off-site vendor

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Date: 07/08/06 (5)

Meter	Manufacturer & Address/Phone	Manufacturer Calibration Frequency Recommendation	BNL Calibration Frequency Policy	BNL Calibration Mechanism
Holaday Microwave Oven Meter Model: 1501	Holaday Industries, Inc. 14825 Martin Drive Eden Prairie, Minnesota 55344 Phone: (612) 934-4920 FAX: (612) 934-3604 Email: Sales@holadyinc.com	Recommendation Reference: 12 months Operation Manual Manual Date: 2/90 Page: 9	Annual	Off-site vendor
Holaday 3-Axis ELF Magnetic Field Meter Model: 3627	Holaday Industries, Inc. 14825 Martin Drive Eden Prairie, Minnesota 55344 Phone: (612) 934-4920 FAX: (612) 934-3604 Email: Sales@holadyinc.com	Recommendation Reference: Annual Operation Manual Manual Date: 6/92 Page: 20	Annual	Off-site vendor
H-Nu Photo-ionization Detector Model: PI-101 10.2 eV & 11.0 eV	HNu Systems Inc.	Recommendation Reference: Frequency not specified Operation Manual Manual Date: 1975 Page: 19	Out of Service Meter to be held out-of-service as replacement for TVA-1000, will require calibration before use and then on 1 year cycle	IHG via single point calibration with isobutylene standard
Inerscan Chlorine- Compact Portable Analyzer 4000 Series Model: 4340SP Chlorine	Interscan Corporation PO Box 2496 Chatsworth, CA 91313-2496 Phone: (800) 458-6153	Recommendation Reference: Dependent on use, and sensor sensitivity Operation Manual Manual Date: 1991 Page: 3-3	Out of Service	Offsite Vendor
International Light Visible Light Meter Radiometer/Photometer Model: IL1400A	International Light, Inc. 17 Graf Road Newburyport, MA 01950-4092 Phone: (508) 465-5923 FAX: (508) 462-0759	Recommendation Reference: No frequency recommendation. Factory pre-sale Cal is by electronic means and manual implies that no re-calibration is needed. Operation Manual Manual Date: Rev. 920210 Page: 27	No calibration required for qualitative check use No OEL compliance use without annual calibration	Off-site vendor
International Light UV Actinic Radiometer Model: IL 530	International Light, Inc. 17 Graf Road Newburyport, MA 01950-4092 Phone: (508) 465-5923 FAX: (508) 462-0759	Recommendation Reference: Operation Manual Manual Date: Page:	Out of service No OEL compliance use allowed without calibration	Off-site vendor
International Light	International Light, Inc.	Recommendation Reference:	Out of service	Off-site vendor

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Date: 07/08/06 (6)

Meter	Manufacturer & Address/Phone	Manufacturer Calibration Frequency Recommendation	BNL Calibration Frequency Policy	BNL Calibration Mechanism
Research Radiometer Model: IL 700A	17 Graf Road Newburyport, MA 01950-4092 Phone: (508) 465-5923 FAX: (508) 462-0759	Operation Manual Manual Date: Page:	No OEL compliance use allowed without calibration	
K&D Indoor Air Quality Monitor Model: KD451	K.D. Engineering Unit 34 4291 Meridian Street Bellingham, Washington 98226 Phone: (800) 308-7717 FAX: (800) 739-4497 Email: info@teamkd.com	Recommendation Reference: No recommendation stated Operation Manual Manual Date: July, 1999 Page: 10	Out of service, if repaired, calibration only as needed, meter is not used for OEL measurements	Off-site vendor or manufacturer maintenance and calibration of sensors
			Out of service, prior to use and then Annual	IHG calibration via single point calibration for CO and CO2
Metrolab THM 7025 Magnetic Field Meter	GMW Associates PO Box 2578 Redwood City, CA 94064 651-802-8292 www.gmw.com	Recommendation Reference: Annual Operation Manual- none Calibration Certificate dated 4/17/01	Annual	Off-site vendor
Mettler Toledo Balance AG245	Mettler Toledo, Inc. PO Box 71 Hightstown, NJ 08520-0071 609-448-3000	Recommendation Reference: Internal weight test. Do at start up and after every location change and at regular interval (not specified) Operation Manual Manual Date: 1995 Page: 13	Annual	IHG test with internal weight, if it cannot be electronically set, vendor service call will be made.
Mettler Toledo Balance PB3002	Mettler Toledo, Inc. PO Box 71 Hightstown, NJ 08520-0071 609-448-3000	Recommendation Reference: Internal weight test. Do at start up and after every location change and at regular interval (not specified) Operation Manual Manual Date: no date Page: 8	Annual	IHG test with internal weight, if it cannot be electronically set, vendor service call will be made.
MIE FAM Fibrous Aerosol Monitor Model: FAM-1	MIE/GCA/Environmental Instruments 213 Burlington Road Bedford, MA 01730 Phone: (617) 275-5444	Recommendation Reference: 500 hrs or 1 year Operation Manual Manual Date: 8/88 Page: 25	Annual	Off-site vendor

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Date: 07/08/06 (7)

Meter	Manufacturer & Address/Phone	Manufacturer Calibration Frequency Recommendation	BNL Calibration Frequency Policy	BNL Calibration Mechanism
MIE RAM Real-Time Aerosol Monitor Model: RAM-1	MIE/GCA/Environmental Instruments 213 Burlington Road Bedford, MA 01730 Phone: (617) 275-5444	Recommendation Reference: No Recommendation stated Operation Manual Manual Date: 9/79 Page:	Annual	Off-site vendor
MIE Mini-RAM Aerosol Monitor Model: PDM-3	MIE/GCA/Environmental Instruments 213 Burlington Road Bedford, MA 01730 Phone: (617) 275-5444	Recommendation Reference: No Recommendation stated Operation Manual Manual Date: March 1990 Sections 1.4, 8.0, 12.0	Prior to use for OEL compliance measurements, meter must have a zero offset is less than 3 mg/m³. If not factory calibration or PDM-RS calibration is required.	Off-site vendor or BNL use of a Reference Scatterer (MIE model PDM-RS)
Narda Broadband Isotropic Radiation Monitor Model: 8306b/ 8616	Narda 435 Moreland Road Hauppauge, NY 11778 Phone (631) 231-2700 FAX: (631) 231-1711 Email: nardaeast@L-3com.com	Recommendation Reference: No recommendation stated Operation Manual Manual Date: 11/76 Pages: 4: 6-14 Narda Calibration Service User's Guide 12 months	Out of Service- Meter to be held out-of-service as replacement for Narda 8718B, will require calibration before use and then on 2 year cycle	Out of Service
Narda Microwave Oven Survey Meter Model: 8110	Narda 435 Moreland Road Hauppauge, NY 11778 Phone (631) 231-2700 FAX: (631) 231-1711 Email: nardaeast@L-3com.com	Recommendation Reference: No recommendation stated Operation Manual Manual Date: 7/70 Pages: Narda Calibration Service User's Guide 12 months	Out of Service- Meter held out-of-service as replacement for Holaday 1501, will require calibration before use and then on 2 year cycle	Out of Service
Narda Electromagnetic Radiation Survey Meter (yellow case) Model: 8718B	Narda 435 Moreland Road Hauppauge, NY 11778 Phone (631) 231-2700 FAX: (631) 231-1711 Email: nardaeast@L-3com.com	Recommendation Reference: Every 2 years Operation Manual Manual Date: 2/2000 Pages: 129	2 year	Off-site vendor
Niton XRF Spectrum Analyzer	NITON Service 610 Ten Rod Road North Kingstown, RI 02852 Voice: (401) 294-1234	Recommendation Reference: Every 24 months Operation Manual	2 year or each source change which is less	Off-site vendor or manufacturer
			Prior to and after each use	IHG check of field

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Date: 07/08/06 (8)

Meter	Manufacturer & Address/Phone	Manufacturer Calibration Frequency Recommendation	BNL Calibration Frequency Policy	BNL Calibration Mechanism
Model: 300 & 700 Series	FAX: (401) 295-2090 Email: support@niton.com	Manual Date: 1998 Page: Page 1-12		reference standards
Nucon Aerosol Detector Model: Model F	Nuclear Consulting Services, Inc. 7000 Huntley Road Columbus, Ohio 43229-1035 Phone: (614) 846-5710 FAX: (614) 431-0858	Recommendation Reference: Field Calibration Checks for Normal Use Operation Manual Manual Date: 11/90 Rev. 1 Page: 5	Annual	Off-site vendor
Photovac Voyager Gas Chromatograph Model: Voyager	PE Photovac 761 Main avenue Norwalk CT 06859 203-761-5330	Recommendation Reference: Start of each day and at 8 hours using calibration gas standard Operation Manual Manual Date: 12/97 Page: 59 & 9	Qualitative analysis use only (non OEL) – prior to each use	IHG bump test with any detectable chemical
			Quantitative Analysis for OEL compliance- Annual	IHG via single point calibration with cylinder standard
Protimeter Moisture Indicator Model: <i>SurveyMaster</i> SM	GE Protimeter PLC Meter House Marlow Bucks SL7 1LW England (800) 321-4878 www.protimeter.com	Recommendation Reference: Calibrate with the “Protimeter Check” test device before each use. Operation Manual Manual Date: May 2002 Page: 10	Before each use	n/a
Questemp 15 Model: Area Heat Stress Monitor	Quest Technologies 510 Worthington Street Oconomowoc, WI 53066 Phone: (414) 567-9157 Phone: (800) 245-0779 FAX (414) 567-4047	Recommendation Reference: No Recommendation stated Operation Manual Manual Date: 11/97 Rev. C Page: 34	Annual	Off-site or IHG via water temperature bath and NIST thermometer for multiple point calibration
Questemp 34 Model: Area Heat Stress Monitor	Quest Technologies 510 Worthington Street Oconomowoc, WI 53066 Phone: (414) 567-9157 Phone: (800) 245-0779 FAX (414) 567-4047	Recommendation Reference: No Recommendation stated Operation Manual Manual Date: 05/20057 Rev. B Page: 34	Annual	Off-site or IHG via water temperature bath and NIST thermometer for multiple point calibration
Questemp II	Quest Technologies	Recommendation Reference:	Annual	Off-site

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Date: 07/08/06 (9)

Meter	Manufacturer & Address/Phone	Manufacturer Calibration Frequency Recommendation	BNL Calibration Frequency Policy	BNL Calibration Mechanism
Model: Personal Heat Stress Dosimeter	510 Worthington Street Oconomowoc, WI 53066 Phone: (414) 567-9157 Phone: (800) 245-0779 FAX (414) 567-4047	Cal Probe for ear/environment differential (internal electronic equilibrate) before and after each use. Operation Manual Manual Date: 7/94 Rev. C Page: 11		or IHG via water temperature bath and NIST thermometer for multiple point calibration
			Before and After each use	Internal electronic equilibrate cycle in meter operation
Quest Noise Dosimeter Model: Quest Q-300 Noise Dosimeter	Quest Electronics 510 Worthington Street Oconomowoc, WI 53066 Phone: (414) 567-9157 Phone: (800) 245-0779 FAX (414) 567-4047	Recommendation Reference: Yearly- factory check out Prior to use with Calibrator Operation Manual Manual Date: 2/2000 rev. H Page: 5	Annual	Off-site maintenance check and calibration
			Prior to each use	IHG field calibrator, single point at 1000 Hz, A-weighted
Quest Acoustic Calibrator Model: QC-10/ QC-20	Quest Electronics 510 Worthington Street Oconomowoc, WI 53066 Phone: (414) 567-9157 Phone: (800) 245-0779 FAX (414) 567-4047	Recommendation Reference: Not stated Operation Manual Manual Date: 2/2000 rev. H Page: 4-5	Annual	Off-site
Quest Noise Dosimeter Model: Quest NoisePro DLX	Quest Electronics 510 Worthington Street Oconomowoc, WI 53066 Phone: (414) 567-9157 Phone: (800) 245-0779 FAX (414) 567-4047	Recommendation Reference: Return periodically to factory for recalibration- recommends annual Prior and after use with Calibrator Operation Manual Manual Date: 01/23/04 rev C Page: 10, 15, 17, 75	Annual	Off-site maintenance check and calibration
			Prior to and after each use	IHG field calibrator, single point at 1000 Hz A-weighted for SPL
Quest 2100 Sound Level Meter Model: 2100	Quest Electronics 510 Worthington Street Oconomowoc, WI 53066 Phone: (414) 567-9157 Phone: (800) 245-0779 FAX (414) 567-4047	Recommendation Reference: Prior to use with Calibrator Operation Manual Manual Date: 2000 Rev A Page: 7	Annual	Off-site maintenance check and calibration
			Prior to and after each use	IHG field calibrator, single point at 1000 Hz A-weighted for SPL
Scott Scout	Tyco: Scott Technologies Inc. Scott Instruments 251 Welsh Pool road	Recommendation Reference: As per user set intervals Before each use, test sensors	Annual (minimum), target goal is Quarterly	IHG single point calibration with standard gas for each sensor

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Date: 07/08/06 (10)

Meter	Manufacturer & Address/Phone	Manufacturer Calibration Frequency Recommendation	BNL Calibration Frequency Policy	BNL Calibration Mechanism
Multi-Gas Personal Monitor	Exton PA 19341 610-363-5450	using a known concentration of calibration gas to verify within 10% of actual gas concentration. Operation Manual #087-0019 Manual Date: March 2003 Pages: 23 - 26	Before each use	IHG bump check with gas for each sensor to be measured in field.
Singer Dry Test Meter Model:	American	Recommendation Reference: Operation Manual Manual Date: Page:	Prior to use if over one year from calibration	IHG with Soap Film Flow Meter multipoint calibration or Off-site Vendor
SKC Low Flow Pump Model: SKC 222-3	SKC	Recommendation Reference: Operation Manual Manual Date: Page:	Prior to and after each use	BY IHG via - DryCal - Soap Film Flow Meter
SKC High Flow Pump Model: SKC 224-43XR SKC 224-44XR	GAST	Recommendation Reference: Operation Manual Manual Date: Page:	Prior to and after each use	BY IHG via - DryCal - Soap Film Flow Meter - Singer Dry Test Meter
Thermo Sapphire Infrared Analyzer Model: Miran 205B	Thermo Environmental Instruments 8 West Forge Parkway Franklin MA 02038	Recommendation Reference: Factory Calibration on initial shipment, user performed calibration built internal into meter. Page 99 provides method for user calibration. Additional info MI-611-035 Operation Manual Manual Date: 3/99 Page: 48 and 99	Qualitative analysis use only (non OEL) – prior to each use	IHG bump test with any chemical in instrument inventory
			Quantitative Analysis for OEL compliance- Annual	IHG calibration for compound of interest using closed loop
			3 year cycle	Send to Offsite Vendor for maintenance and calibration with single gas
Thermo TVA-1000	Thermo Environmental Instruments	Recommendation Reference: Beginning of each workday w/ calibration gas	Qualitative analysis use only (non OEL) – prior to each use	IHG bump test with chemical(s) in question

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Date: 07/08/06 (11)

Meter	Manufacturer & Address/Phone	Manufacturer Calibration Frequency Recommendation	BNL Calibration Frequency Policy	BNL Calibration Mechanism
PID/FID Analyzer (Foxboro) Model: TVA-1000	8 West Forge Parkway Franklin MA 02038	Operation Manual Manual Date: 8/31/93 Page:25	Quantitative Analysis for OEL compliance- Each day of use	IHG calibration for compound of interest using cal gas standard or closed loop
			3 year cycle	Send to Offsite Vendor for maintenance and calibration with single gas
TSI Q-track IAQ monitor	TSI Incorporated ATT: Customer Service 500 Cardigan Road Shoreview, MN 55126 Phone: (612) 483-4711 (800) 876-9874 FAX: (612) 490-2874	Recommendation Reference: Annually Operation Manual Manual Date: Feb 2001 Page: 35	Annual	Factory or off-site vendor calibration, maintenance, and check of internal generation source lamp
TSI Condensation Particle Counter Model :3007	TSI Incorporated ATT: Customer Service 500 Cardigan Road Shoreview, MN 55126 Phone: (612) 483-4711 (800) 876-9874 FAX: (612) 490-2874	Recommendation Reference: Annual Cleaning and Calibration at factory Operation Manual Manual Date: Feb 2004 1930035 RevD Page: 25	Annual	At TSI factory authorized location
TSI VelociCalc Air Velocity Meters Models: 8355/8357 and 8360	TSI Incorporated ATT: Customer Service 500 Cardigan Road Shoreview, MN 55126 Phone: (612) 483-4711 (800) 876-9874 FAX: (612) 490-2874	Recommendation Reference: Annual Operation Manual Manual Date: 2/92 Page: 32	Annual	RCD IC wind tunnel or Offsite vendor
Walker Static Magnetic Field Meter Model: FGM-3D1	Quality Assurance Product Group Rockdale Street Worcester, MA 01606 Phone: (508) 852-3674 FAX: (508) 856-9931	Recommendation Reference: No Recommendation stated Operation Manual Manual Date: no date Page: 21	None- no OEL compliance use allowed without calibration	Meter NOT to be used for OEL compliance monitoring (meter range is too sensitive for use without cancellation of earth's magnetic field, source must be removed or shut off to zero meter)